UNI-SOLAR®

SOLAR ELECTRIC MODULE ES-124 & ES-62T
Owners Manual and Installation Guide

CAUTIONS

Solar electric modules produce DC electricity when exposed to light. The voltage from one individual module is not considered hazardous. However, if modules are connected in series to increase voltage, or in parallel to increase current, the shock hazard increases. When installing or working around photovoltaic modules, batteries and related electrical equipment, observe industry standards and practices as well as manufacturer's safety recommendations.

WARNINGS

- Cover the solar modules with an opaque material before making your wiring connections. This will prevent the modules from producing electricity while making the connections and reduce the risk of electrical shock or sparks.

- Use insulated tools and observe safe electrical practices at all times.

- Make connections in a well-ventilated area free from flammable gas vapors and open flames. Observe proper polarity when connecting the modules into an electrical circuit. Reverse connection will damage the module and may result in fire.

- Do not use any solar module without a blocking diode to prevent reverse currents from flowing into the module from the battery. A charge controller with a blocking diode or "night-time" disconnect feature will work well in this capacity.

- Do not attempt to concentrate sunlight on the modules for increased output. Doing so may cause damage and will void the warranty.

- Do not walk on the modules and avoid dropping any sharp object on the face of the module.

- Contact appropriate authorities before installing solar electric modules to determine if permits and inspections are required for your particular area.

- Ground module frame and all metal structures for all systems of any voltage.

- Follow the requirements of the National Electric Code or other applicable codes for your location.

- Only qualified persons should perform module installation. If you are not familiar with electrical power equipment, contact a trained electrician to assist you with your installation.

DISCLAIMER OF LIABILIITY

The information contained in this manual is based on United Solar Ovonic's knowledge and experience, but such information and suggestions do not constitute a warranty expressed or implied. The methods of installation, use and maintenance of solar modules are beyond the control of United Solar Ovonic. United Solar Ovonic assumes no responsibility and expressly disclaims liability for any loss, damage or expense associated with the use, installation or operation of the product. Any liability of United Solar Ovonic is strictly limited to the Limited Warranty attached hereto. United Solar Ovonic reserves the right to make changes to product specifications or to the instruction manual without notice.

INSTALLATION

Figure 1

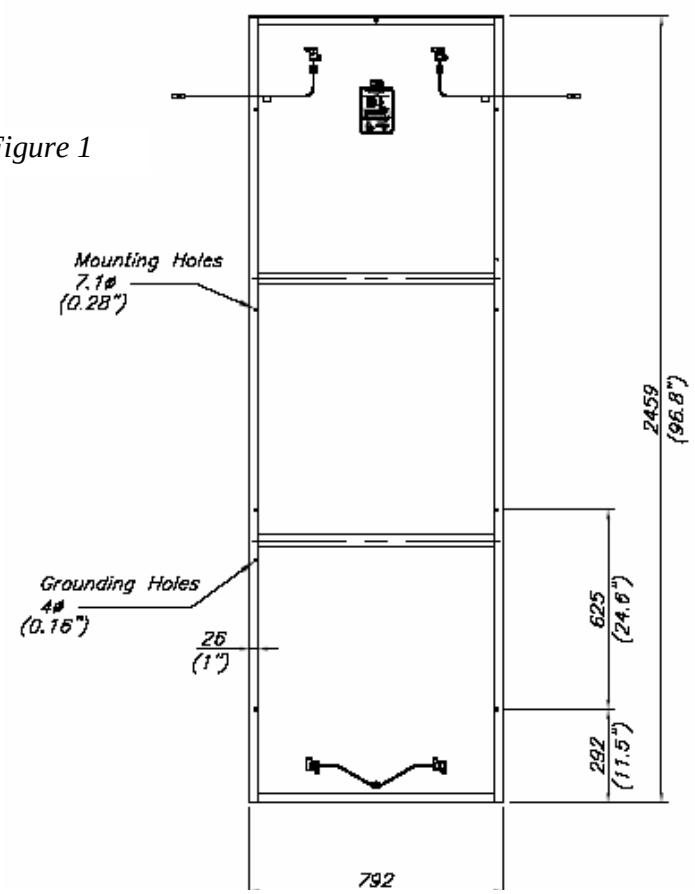
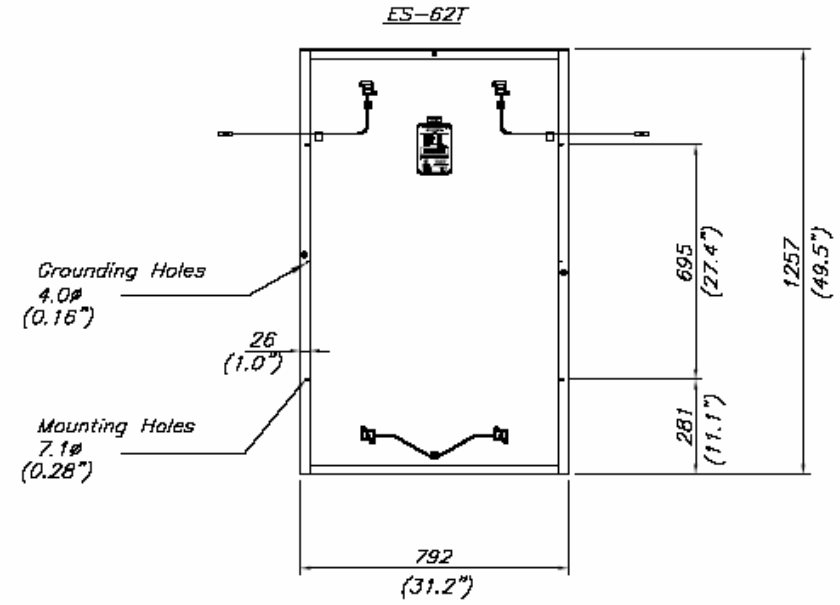
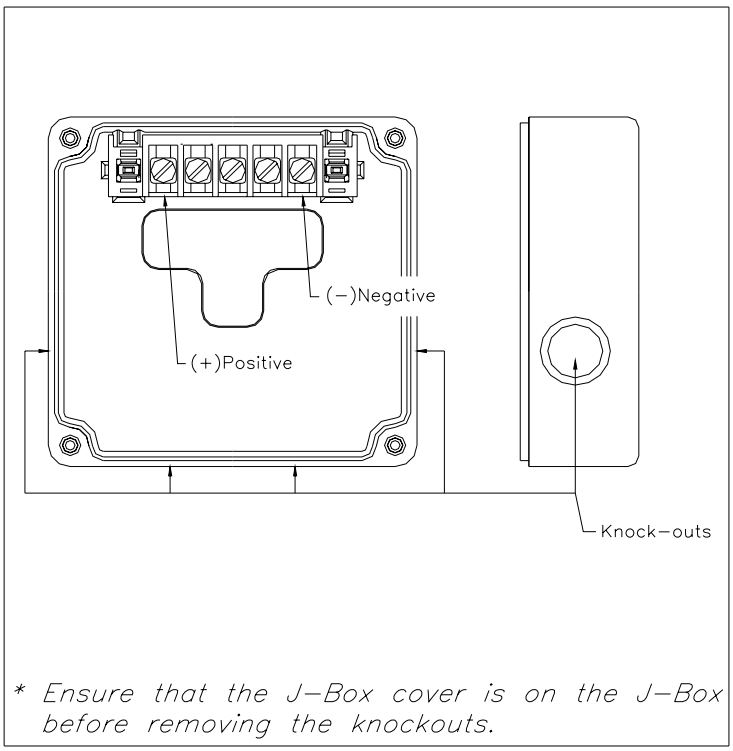


Figure 2



Mounting

Mounting holes on the aluminum frame of the modules are provided that fit 7mm (¼ inch) diameter fasteners (see Figure 1 and 2). Mount the ES-124 module using eight (8) fasteners with lock washers and nuts. Mount the ES-62 module using four (4) fasteners with lock washers and nuts. Clearance between the module and the mounting surface can be the minimum necessary to prevent wire chafing. When installing modules on a building, use standoff or rack methods. Contact your United Solar Ovonic distributor for details.



* Ensure that the J−Box cover is on the J−Box before removing the knockouts.

Orientation

Pick a location with the maximum exposure to sunlight. Avoid shadows, especially during the middle of the day (i.e. "peak sun hours", 09:30 to 16:30). Orient the module so that the surface will receive the maximum sun exposure over the year for your particular site. Typically this is achieved by tilting the module toward the equator at an angle equal to the latitude of the site. For optimum summer performance, reduce the tilt angle by 15 degrees below the latitude angle. To increase winter performance, increase the tilt angle 15 degrees above the latitude angle. The tilt angle should always be greater than 10º to ensure adequate rain water cleaning of the module.

Wiring With Standard "Quick Connect" Terminals:

The ES Series PV modules are wired to your balance-of-system components or to other ES Series PV modules using the exterior-rated, insulated wires and "quick-connect" terminals. There is a positive wire with terminal and a negative wire with terminal. Modules can be wired in series up to 1000 VDC max (TUV) & 600 VDC per UL by plugging the male terminal into the female terminal, positive to negative. The "quick-connect" wire terminals are not designed to be disconnected while the module is producing power. If the "quick-connect" terminals must be pulled apart while the module is in the sun, the technician must cover the solar module before disconnecting the terminals.

Wiring With Optional Junction Boxes:

The ES Series modules can also be ordered with standard Junction Boxes. The junction box is located on the rear of each module. To access the junction box, loosen the four (4) screws and lift off the cover. The junction box is equipped with four (4) knockouts that will accept either electrical conduit (13mm, ½ inch trade size) or strain relief fittings. It is not recommended to run wires

Solar Module Specifications

	ES-124	ES-62T
Rated Power (Watts)	124	64
Operating Voltage (Volts)	30.0	15.0
Operating Current (Amps)	4.1	4.1
Open Circuit Voltage (Volts)	42.0	21.0
Short Circuit Current (Amps)	5.1	5.1
Series Fuse Rating	8 A	8 A
Minimum Blocking Diode	8 A	8 A
Weight (kilogram / lb.)	20.5 kg (45 lb.)	10.9 kg (24 lb.)

During initial 8-10 weeks of operation, the module has higher electrical output than rated output. The output may be higher by 15%, the operating voltage may be higher by 11% and the operating current may be higher by 4%.

Electrical specifications (±5%) are based on measurements performed at Standard Test Conditions of 1000 W/m^2 irradiance, Air Mass 1.5, and Cell Temperature of 25ºC after long-term stabilization. Performance may vary up to 10% from rated power due to low temperature operation, spectral and related effects.

through the knockouts without the use of either strain relief fittings or conduit. You may use any combination of knockouts that is the most convenient for your installation.

Use a tool such as a screwdriver to remove the knockout. **The junction box cover should be placed on the junction box before the knockout is removed.** A screwdriver should be placed at the indicated (arrow) spot on the junction box knockout. Install either a strain relief fitting or a conduit fitting. Follow the diagram in Figure 2 to make your wiring connections. Reposition the cover on the junction box and tighten the four (4) screws.

Blocking Diodes and Fuses

Proper use of a suitable blocking diode will prevent reverse current flow into a module from a battery or from another charging source (ex. a generator).

All systems that include a battery must have a blocking diode between the battery and the solar module. Usually the blocking diode (or night-time disconnect circuit) is included with a charge controller (i.e. voltage regulator). Additional series blocking diodes can be used within the array (one diode per parallel string) to increase daily array output in locations with severe shading over parts of the array during peak sun hours (09:30 to 16:30).

United Solar Ovonic requires the use of a properly sized fuse on single modules or strings of modules wired in parallel with other strings of modules (or individual modules). See table for appropriate series fuse rating.

Bypass Diodes

Every solar module includes a bypass diode across each cell, which results in reduced power loss under partial shadow conditions. When two (2) or more modules are connected in series, a bypass diode can be installed in the module junction box using the supplied jumpers, providing further shadow tolerance. For assistance contact United Solar Ovonic.

Charge Regulation

The use of a charge controller (i.e. voltage regulator) is recommended in battery systems to prevent the solar module from overcharging the battery and to optimize the charge rate for the battery. Follow the manufacturer's instructions for installation of the charge controller.

High Voltage Systems

Solar modules are suitable for use in high voltage systems up to 1000 volts (TUV). Modules meet IEC 61646 requirements. Underwriters Laboratory rates these same modules for use in high voltage systems up to 600 VDC. Contact United Solar

Ovonic for specific design advice and assistance.

Wiring Selection

Use insulated, stranded copper wire rated for at least 90ºC for module-to-module wiring. Allowable wire size is 2.081 mm^2 – 5.261 mm^2 (AWG #14-10). Wire insulation and size should be chosen for maximum temperature and environment. Refer to the National Electric Code section 690.8 or other recognized standards.

Grounding

The frame of each module should be connected to earth ground. A self tapping screw and cup washer are provided with each module that can be used to attach a ground wire to the frame using the grounding hole shown in Figure 1. Place a copper grounding wire in between the cup washer and screw head. Module mounting fasteners can be used for grounding purposes, in which case a star lock washer must be used to ensure a good electrical connection to the module frame. Consult the National Electric Code or other recognized standards for grounding requirements

Maintenance

Check the wiring connections periodically for tightness and corrosion. Clean the front surface of the modules as needed with mild soap and water. Do not use abrasive cleaners or solvents. Be careful when washing the modules, as the combination of water and electricity may present a shock hazard. Wear electrical gloves and disconnect the module from the batteries. Short-circuit the output of the module or wash at night.

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WARRANTY

Limited Warranty Twenty-Year

United Solar Ovonic warrants the solar module against lost power output as follows: For a period of twenty (20) years from the date of sale to the original purchaser, modules returned by the original purchaser to an authorized United Solar Ovonic Distributor or Service Facility which upon inspection are determined to exhibit a power output of less then 80% of the Minimum Rated Power specified at the time of sale due to defects in materials or workmanship will be repaired or replaced, or, at the option of United Solar Ovonic, it will replace such lost power by providing to buyer additional modules to restore total wattage of all defective modules in the user's installation or system to 80% of the Rated Power output.

What is not covered by the Warranty

The warranty does not apply to any module which in the judgment of United Solar Ovonic has been subject to misuse, neglect or accident or which has been damaged though abuse, alteration, improper installation or application, or negligence in use, storage, transportation or handling, or repaired by anyone other than United Solar Ovonic. The warranty does not cover any transportation costs for return of module or for re-shipment of any repaired or replaced module, or cost associated with the installation, removal or re-installation of modules.

Warranty Limitations

United Solar Ovonic shall have no responsibility for damage to persons or property or other loss or injury resulting from defect in the module or from improper use or installation. Under no circumstances will United Solar Ovonic be liable for any incidental or consequential damage. Any warranties implied by law, including those of merchantability and fitness for a particular purpose are herby expressly disclaimed. The maximum liability of United Solar Ovonic is limited to the purchase price of the system.

Such Liability shall be limited in duration to twelve (12) months from the date of original purchase. This warranty is in lieu of all other warranties, expressed or implied. The purchaser's exclusive remedy shall be only as stated herein. Some States do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

Obtaining Warranty Performance

Please keep receipt of purchase to verify date of purchase. If you feel you have a claim under this warranty, first contact the dealer who sold you the module or any Authorized United Solar Ovonic Dealer or Distributor. Check local telephone listings for location. The dealer of distributor will give advice on handling the claim. If further assistance is required, contact United Solar Ovonic for instructions. The factory will not accept the return of any module unless United Solar Ovonic has given prior written authorization.

This warranty gives you specific legal rights and you may also have other rights, which vary from State to State.